Improving the Short-Term Prediction of Suicidal Behavior

HHS Public Access

Author manuscript

Am J Prev Med. Author manuscript; available in PMC 2017 January 23.

Published in final edited form as:

Am J Prev Med. 2014 September ; 47(3 Suppl 2): S176–S180. doi:10.1016/j.amepre.2014.06.004.

Improving the Short-Term Prediction of Suicidal Behavior

Catherine R. Glenn, PhD and **Matthew K. Nock, PhD**

Department of Psychology, Harvard University, Cambridge, Massachusetts

Abstract

Aspirational Goal 3 of the National Action Alliance for Suicide Prevention's Research Prioritization Task Force is to predict who is at risk for attempting suicide in the near future. Despite decades of research devoted to the study of risk and protective factors for suicide and suicidal behavior, surprisingly little is known about the short-term prediction of these behaviors. In this paper, we propose several questions that, if answered, could improve the identification of short-term, or imminent, risk for suicidal behavior. First, what factors predict the transition from suicidal thoughts to attempts? Second, what factors are particularly strong predictors of making this transition over the next hours, days, or weeks? Third, what are the most important objective markers of short-term risk for suicidal behavior? And fourth, what method of combining information about risk and protective factors yields the best prediction? We propose that the next generation of research on the assessment and prediction of suicidal behavior should shift, from cross-sectional studies of bivariate risk and protective factors, to prospective studies aimed at identifying multivariate, short-term prediction indices, examining methods of synthesizing this information, and testing the ability to predict and prevent suicidal events.

Introduction

Suicide is a leading cause of death worldwide.[1–3] In order to ultimately prevent suicide, we need to be able to predict who is at greatest suicide risk so targeted interventions can be employed. Over the past few decades, impressive gains have been made in identifying lifetime, or long-term, risk and protective factors for suicide deaths and suicide attempts (i.e., nonfatal suicidal behavior).[4–9] However, one of the most important jobs of clinicians is to determine who is at short-term, or imminent, risk for suicide. This decision is extremely difficult because alarmingly little is known about the short-term risk factors for suicide. Not surprisingly, Aspirational Goal 3 of the National Action Alliance for Suicide Prevention's (Action Alliance) Research Prioritization Task Force is to improve prediction of short-term, or imminent, suicide risk.

The purpose of this paper is to highlight gaps in our knowledge about the short-term prediction of suicide and to suggest the types of breakthroughs needed to fill these gaps. Suicide death is challenging to study because it is a low base rate event. Nonfatal suicidal behavior (e.g., suicide attempt) is much more common, often leads to serious harm in itself,

Address correspondence to: Catherine R. Glenn, PhD, Department of Psychology, Harvard University, William James Hall, 1280, 33 Kirkland Street, Cambridge MA 02138. catherienglenn@fas.harvard.edu.

No financial disclosures were reported by the authors of this paper.

and is currently the most robust risk factor for suicide death.[5, 8, 10] Therefore, as a key first step in this line of research, we outline the research needed to improve the prediction of suicidal behavior, which, given its frequency, increases the statistical power of prediction studies.

What We Know

Most of what is known about the prediction of suicidal behavior comes from epidemiologic studies of lifetime and 12-month suicide ideation and attempts.

Prevalence

Approximately 9.2% of adults have seriously considered suicide, 3.1% have formulated a suicide plan, and 2.7% have attempted suicide in their lifetime.[6] In regard to 12-month prevalence, approximately 2% of adults report past-year suicide ideation, 0.6% report suicide plans, and 0.3% report a suicide attempt.[8]

Age of Onset and Course

Suicide ideation and attempts are relatively rare in childhood, but rates increase dramatically during adolescence and remain high throughout adulthood.[3, 11] Of particular importance for short-term prediction, approximately one third of individuals with suicidal thoughts will transition to make a suicide plan, and one third of those with suicidal thoughts will make a suicide attempt in their lifetime.[6] More than 60% of individuals who progress from thinking about suicide to attempting suicide will do so within the first year after the onset of suicide ideation,[6, 9, 11] suggesting that the year after the first onset of suicide ideation is a particularly high-risk time. However, few variables have been identified that predict which individuals with suicide ideation go on to make a suicide attempt. Therefore, the field knows much less about who is likely to act on their suicidal thoughts, and, for those at risk, when they are likely to take suicidal action.

Moreover, very little research has focused on the persistence of suicide ideation and attempts. In one of the only studies to do so, Kessler and colleagues,[3] using the WHO World Mental Health (WMH) Surveys data, found that for most individuals with suicidal thoughts and behaviors (51% of suicide ideators, 59% of planners, and 70% of attempters), the behavior will not persist for more than 1 year. For the remaining percentage of individuals, however, suicidal thoughts and behaviors can be chronic and even lifelong.

Risk factors

A range of lifetime and 12-month risk factors for suicide ideation and attempts have been identified, including sociodemographic factors, stressful life events, family history of psychopathology, presence and accumulation of mental disorders, and past suicidal thoughts and behaviors.[2, 5] However, there is still much to learn about how these factors confer risk for future suicidal behavior. For instance, although past suicidal behavior is one of the most robust risk factors for future suicidal behavior,[5, 8, 10] 60% of previous attempters will not make another suicide attempt in their lifetime,[3] and many people who die by suicide have no previous history of suicidal behavior.[12] Moreover, it is unclear whether these long-term

variables hold any value for the short-term prediction of suicidal behavior. Time-invariant factors, like gender, clearly do not. In contrast, time-varying factors, such as the presence of multi-morbidity, may be predictive of short-term risk. However, we are unaware of any existing studies with this temporal resolution.

Breakthroughs Needed

Below, we present four key questions that highlight the gaps in our current knowledge of short-term predictors of suicidal behavior, and suggest breakthroughs needed to advance existing research.

1. What Factors Predict the Transition from Suicidal Thoughts to Attempts?

Although suicide ideation is a well-documented risk factor for suicidal behavior, the majority of those with suicidal thoughts do not go on to make a suicide plan or attempt. Therefore, it is vital to improve prediction of which individuals are likely to act on their suicidal thoughts. Unfortunately, most identified risk factors, such as major depression, predict suicide ideation but not attempts among those thinking about suicide.[3, 13] Data from the WHO WMH Surveys indicate that, whereas known risk factors account for 62.4% and 80.3% of the variance in predicting suicide ideation and attempts, respectively, these same risk factors account for only 7.1% of the variance predicting suicide attempts among ideators.[3] Recent research has started to identify some risk factors that do differentiate suicide attempters from suicide ideators, including younger age, low income or unemployment, history of childhood adversities,[8, 10] disorders characterized by agitation, impulsiveness, and aggression,[8, 13] parental history of panic and antisocial behavior,[8, 14] and history of sexual violence.[15] However, much more progress is needed in this direction.

2. What Factors Predict this Transition Over the Next Hours, Days, or Weeks?

Previously identified long-term risk factors have unknown abilities for predicting the transition from suicidal thoughts to actions over the short-term, and research suggests there may be important differences between the risk conferred by short- and long-term variables. For instance, Fawcett et al.[16] found that hopelessness and suicide ideation predicted suicide over the longer-term (2–10 years), whereas anxiety, insomnia, and anhedonia predicted suicide death over the next 12 months. Although long-term risk factors may indicate who is more likely to engage in suicidal behavior in their lifetime, distinct short-term risk factors are necessary for indicating when individuals are likely to act on their suicidal thoughts.[16, 17] Research on short-term risk has been hampered by three key methodological limitations.

First, though the field generally agrees on the overall distinction between chronic and acute risk factors, there is no consensus definition for what constitutes short-term, or imminent, risk (i.e., subsequent hours, days, or weeks). Second, most studies measuring suicide risk factors use a long assessment window (i.e., lifetime or past year). Studies that have examined more short-term risk factors indicate that suicidal behavior is often closely preceded by acute substance use,[18] interpersonal negative life events,[17] and extreme anxiety, agitation, or other negative affective states.[12] However, because most previous studies used small, selective samples without a comparison group, it is unclear how these results will

generalize to other populations, or how unique these risk factors are to suicide, as compared to psychiatric crises more broadly. A third limitation is the reliance on retrospective self-reports, which, although a valuable source of information, can be limited by bias and unreliability (e.g., forgetting). What are needed now, in addition to such studies, are prospective examinations of short-term (i.e., over the next hours, days, and weeks) predictors of suicidal behavior.

3. What Are the Most Important Objective Markers of Short-Term Risk?

The current state of the art in acute suicide risk assessment is to ask individuals questions such as: *Do you have any plan or intent to kill yourself?* Research has therefore been limited by an almost exclusive reliance on self-reported likelihood of future engagement in suicidal behavior, which may be biased for a variety of reasons (e.g., motivation to conceal suicide plans and intentions).[12, 19] Given the limitations of self-report methods, the field needs new and objective ways of measuring suicide risk (i.e., assessment not biased by opinion or interpretation). Importantly, measures and tests that objectively assess suicide risk are currently being developed, including: (1) behavioral measures of implicit suicidal cognition[20]; (2) neurocognitive measures of difficulties in attention, working memory, and executive functioning[21]; and (3) biological tests of dysfunction in the serotonergic system and hypothalamic–pituitary–adrenal axis.[4] Though promising, these tests are not currently used in practice to assess risk, and it is not yet clear if and how they might be combined with existing risk factors to improve the accuracy of resulting predictions.

4. What Method of Combining Information About Risk and Protective Factors Yields the Best Prediction?

There is currently no empirically supported method for incorporating these variables in a way that informs our determination of an individual's risk for future suicidal behavior (i.e., low, moderate, high, or imminent risk). In the absence of a tool for synthesizing this information, clinical judgment or intuition is currently used, rather than science, to combine details about risk factors—a problematic method given the superiority of actuarial over clinical methods for predicting human behavior.[22]

To address this gap, more research is needed to identify a set of risk factors that maximize prediction sensitivity (i.e., to accurately identify suicides) and specificity (i.e., to accurately identify non-suicides). The development of such prediction is complicated by the low base rate of suicide death.[23] It is unlikely that a single risk factor will effectively predict suicide with both high sensitivity and high specificity. Therefore, research needs to move from bivariate to multivariate prediction models examining combinations of multiple risk factors in the same large sample.

Notably, several recent studies have tested different methods of combining suicide risk factors with some initial success.[8, 10, 24] These risk indices included known sociodemographic and psychiatric risk factors, and were able to accurately classify a substantial portion of individuals (areas under the curve [AUC] ranged from .74 to .88). This means that a randomly selected suicide attempter could be distinguished from a randomly selected suicide ideator with 74%–88% accuracy.[8, 10] Of note, risk indices were moderated

by factors such as attempt planning, suggesting that risk factors may vary among suicidal subgroups. Although promising, these risk indices included lifetime and 12-month risk factors, which provide less information about short-term risk, and are not currently used in naturalistic settings. Future research is needed that incorporates short-term factors into these risk indices, examines how risk indices vary across subgroups, and translates these tools into a form that is easily accessible and interpretable in clinical practice.

Short-Term Research Objectives

Following directly from the limitations and needed breakthroughs described above, the suggested short-term research objectives are to identify: (1) factors that predict the transition from ideation to attempts; (2) risk factors more closely temporally linked to engagement in suicidal behavior; (3) objective risk markers; and (4) scientifically informed methods for combining risk factors. There are many avenues to pursue in order to make these advances. We propose two possibilities for illustrative purposes below.

Large representative samples

For this line of research, it would be ideal to follow large, representative, and demographically diverse samples (i.e., ≥ 10,000 individuals, consistent with sample sizes used in national[9] and cross-national epidemiologic research)[3] over a number of years while assessing a large number of risk factors yearly, or more frequently (e.g., via email/smart-phone). Data from these large-scale samples could be used to examine prospective predictors of the transition from suicide ideation to suicide attempts or completions (e.g., among those without a history of prior attempts), as well as to inform the development of risk indices and algorithms for predicting suicidal behavior, including moderators of multivariate risk index models.

Small high-risk samples

A second set of studies could more intensively monitor small samples (e.g., ≥ 100 individuals, consistent with studies using real-time monitoring techniques)[25, 26] at high-risk for suicide (e.g., previous suicide attempts) to identify acute risk factors more closely linked to suicidal behavior. High-risk studies could focus on frequent monitoring of state-related risk factors (e.g., agitation, suicide planning, recent negative life events) on a weekly, or ideally daily, basis using real-time monitoring.[26] This type of research could improve understanding of specific triggers for suicidal behavior, and, moreover, could help identify acute risk factors that predict suicide attempts among ideators. In addition, small samples are ideal for testing the efficacy of existing objective tools, as well as developing novel objective measures.

Long-Term Research Objectives

The ultimate goal of this research is to use information about short-term risk to help prevent suicide. To this end, after short-term risk factors are identified, the first long-term objective is to develop tools for clinical practice that can more accurately identify who is at risk, as well as *when* and *where* they are at risk for engaging in suicidal behavior. It will be

important for these tools to integrate information about known long-term and short-term risk factors, as well as both subjective and objective measures in a way that is useful in clinical settings. Ideally, these tools could be used to inform decisions about appropriate treatment (e.g., indicating when hospitalization is warranted). A second long-term objective is to design intervention and prevention strategies that target and manipulate known risk factors to examine whether they are causally related to suicidal behavior and can ultimately help decrease the likelihood of future suicidal behavior. For example, studies using objective tools may suggest that interventions aimed at improving specific aspects of memory, attention, or executive functioning could help decrease suicide risk.

Conclusions

Although advances have been made in the long-term prediction of suicidal behavior, there are significant gaps in our knowledge about the short-term prediction of suicide risk. We suggest four key targets for future research that could help improve short-term prediction. Preliminary steps have been made in some of these areas, but a great deal of work is needed to more accurately predict these dangerous behaviors and ultimately help prevent suicide.

Acknowledgments

The research was supported, in part, by a grant from the National Institute of Mental Health (F32 MH097354) awarded to Catherine R. Glenn.

References

1. WHO. Prevention of suicide: guidelines for the formulation and implementation of national strategies. Geneva: WHO; 1996.
2. Nock MK, Borges G, Bromet EJ, Cha CB, Kessler RC, Lee S. Suicide and suicidal behavior. Epidemiol Rev. 2008; 30(1):133–154. [PubMed: 18653727]
3. Nock, MK., Borges, G., Ono, Y. Suicide: Global Perspectives from the WHO World Mental Health Surveys. New York: Cambridge University Press; 2012.
4. Mann JJ, Currier D, Stanley B, Oquendo MA, Amsel LV, Ellis SP. Can biological tests assist prediction of suicide in mood disorders? Int J Neuropsychopharmacol. 2006; 9(4):465–474. [PubMed: 15967058]
5. Joiner TE, Conwell Y, Fitzpatrick KK, Witte TK, Schmidt NB, Berlim MT, et al. Four studies on how past and current suicidality relate even when" everything but the kitchen sink" is covaried. J Abnorm Psychol. 2005; 114(2):291–303. [PubMed: 15869359]
6. Nock MK, Borges G, Bromet EJ, et al. Cross-national prevalence and risk factors for suicidal ideation, plans and attempts. Br J Psychiatry. 2008; 192(2):98–105. [PubMed: 18245022]
7. Cassells C, Paterson B, Dowding D, Morrison R. Long- and short-term risk factors in the prediction of inpatient suicide: a review of the literature. Crisis. 2005; 26(2):53–63. [PubMed: 16138741]
8. Borges G, Nock MK, Abad JM, et al. Twelve month prevalence of and risk factors for suicide attempts in the WHO World Mental Health surveys. J Clin Psychiatry. 2010; 71(12):1617–1628. [PubMed: 20816034]
9. Kessler RC, Borges G, Walters EE. Prevalence of and risk factors for lifetime suicide attempts in the National Comorbidity Survey. Arch Gen Psychiatry. 1999; 56(7):617–626. [PubMed: 10401507]
10. Borges G, Angst J, Nock MK, Ruscio AM, Walters EE, Kessler RC. A risk index for 12-month suicide attempts in the National Comorbidity Survey Replication (NCS-R). Psychol Med. 2006; 36(12):1747–1757. [PubMed: 16938149]

11. Nock MK, Green JG, Hwang I, et al. Prevalence, correlates and treatment of lifetime suicidal behavior among adolescents: results from the National Comorbidity Survey Replication Adolescent Supplement. JAMA Psychiatry. 2013; 70(3):300–310. [PubMed: 23303463]
12. Busch KA, Fawcett J, Jacobs DG. Clinical correlates of inpatient suicide. J Clin Psychiatry. 2003; 64(1):14–19.
13. Nock MK, Hwang I, Sampson NA, Kessler RC. Mental disorders, comorbidity and suicidal behavior: results from the National Comorbidity Survey Replication. Mol Psychiatry. 2010; 15(8): 868–876. [PubMed: 19337207]
14. Gureje O, Oladeji B, Hwang I, et al. Parental psychopathology and the risk of suicidal behavior in their offspring: results from the World Mental Health surveys. Mol Psychiatry. 2011; 16(12):1221–1233. [PubMed: 21079606]
15. Stein DJ, Chiu WT, Hwang I, et al. Cross-national analysis of the associations between traumatic events and suicidal behavior: findings from the WHO World Mental Health surveys. PLoS ONE. 2010; 5(5):e10574. [PubMed: 20485530]
16. Fawcett J, Scheftner WA, Fogg L, et al. Time-related predictors of suicide in major affective disorder. Am J Psychiatry. 1990; 147(9):1189–1194. [PubMed: 2104515]
17. Bagge CL, Glenn CR, Lee H-J. Quantifying the impact of recent negative life events on suicide attempts. J Abnorm Psychol. 2013; 122(2):359–368. [PubMed: 23088374]
18. Chiles JA, Strosahl K, Cowden L, Graham R, Linehan M. The 24 hours before hospitalization: factors related to suicide attempting. Suicide Life Threat Behav. 1986; 16(3):335–342. [PubMed: 3764997]
19. Qin P, Nordentoft M. Suicide risk in relation to psychiatric hospitalization. Arch Gen Psychiatry. 2005; 62(4):427–432. [PubMed: 15809410]
20. Nock MK, Park JM, Finn CT, Deliberto TL, Dour HJ, Banaji MR. Measuring the suicidal mind: implicit cognition predicts suicidal behavior. Psychol Sci. 2010; 21(4):511–517. [PubMed: 20424092]
21. Keilp JG, Gorlyn M, Russell M, et al. Neuropsychological function and suicidal behavior: attention control, memory and executive dysfunction in suicide attempt. Psychol Med. 2013; 43(3):539–551. [PubMed: 22781400]
22. Dawes RM, Faust D, Meehl PE. Clinical versus actuarial judgment. Science. 1989; 243(4899): 1668–1674. [PubMed: 2648573]
23. Pokorny AD. Prediction of suicide in psychiatric patients: report of a prospective study. Arch Gen Psychiatry. 1983; 40(3):249–257. [PubMed: 6830404]
24. Mann JJ, Ellis SP, Waternaux CM, et al. Classification trees distinguish suicide attempters in major psychiatric disorders: a model of clinical decision making. J Clin Psychiatry. 2008; 69(1):23–31. [PubMed: 18312034]
25. Nock MK, Prinstein MJ, Sterba SK. Revealing the form and function of self-injurious thoughts and behaviors: a real-time ecological assessment study among adolescents and young adults. J Abnorm Psychol. 2009; 118(4):816–827. [PubMed: 19899851]
26. Muehlenkamp JJ, Engel SG, Wadeson A, et al. Emotional states preceding and following acts of non-suicidal self-injury in bulimia nervosa patients. Behav Res Ther. 2009; 47(1):83–87. [PubMed: 19027892]